RECOVERY FROM SEXUAL SATIETY IN MALE RATS

by

SALLY BOLCE JACKSON

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## ACKNOWLEDGMENTS

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RECOVERY FROM SEXUAL SATIETY IN MALE RATS

By

Sally Bolce Jackson

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Chairman: Donald A. Dewsbury
Major Department: Psychology

Although it has long been known that a 15-day rest
period is sufficient to provide complete recovery from the
effects of sexual satiety in male rats, and that a 6-day
rest period is apparently not sufficient, evaluation of
recovery during the interval from 6-15 days has not pre-
viously been undertaken.

In this study 18 rats were tested after each of six
periods of recovery: 3, 6, 9, 11, 13, and 15 days follow-
ing satiety. Several methodological controls were employed.
Copulatory experience, including satiety, was given to
sexually naive subjects prior to the experiment. Because
of high variability among individuals relative to within
individuals, the within-subjects design was used. In order
to standardize the exhaustion from which recovery was mea-
sured, subjects were allowed full recovery and then satiated
to a standard criterion prior to each test.

Different rates of recovery were found for different measures of copulatory behavior. While most measures recovered their normal levels by 6 days following satiety, the postejaculatory interval following the second ejaculation still was longer than normal even after 9 days of rest. No changes were seen in intromission frequency. The effect of prior satiety on other within-series measures was seen more clearly in the second and third series than in the first.

The finding that the postejaculatory interval recovers at a different rate than other measures is consistent with models which propose at least two separate mechanisms underlying the normal pattern of copulatory behavior in rats. The finding that the latencies to begin copulation do not recover from the effects of satiety at the same rate as the postejaculatory interval lends support to the idea that these measures do not reflect the operation of the same mechanism.

An unexpected finding was that changes in copulatory behavior occurred over the course of the experiment in the satiety sessions preceding each experimental test. Because of the randomization procedure employed, no confounding interactions were found between running orders and recovery intervals.

# INTRODUCTION

The central importance of reproductive processes in evolution is illustrated by the very definition of a species as "a reproductively isolated aggregate of interbreeding populations." Reproduction is a key element in the concept of biological fitness, which is measured in terms of the number of viable, fertile offspring an individual leaves.

Of reproductive processes, the most versatile and far-reaching in its effects is behavior. "Behavior is perhaps the strongest selection pressure operating in the animal kingdom. . . . A shift into a new niche or adaptive zone is almost without exception initiated by a change in behavior. The other adaptations to the new niche, particularly structural ones, are acquired secondarily. . . . The precedence of behavior over structure is most easily demonstrated with respect to courtship patterns in birds and the accumulation of morphological characteristics that make the courtship more conspicuous and stimulating" (Mayr, 1970, pp. 387, 363, 364).

Courtship and reproductive behavior provide the largest and most important class of reproductive isolating mechanisms, which function to prevent the wastage of gametes and constitute the most indispensable step in speciation.

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Because of the intimate relationship of mating behavior
with fitness, copulatory behavior can provide a good focus
for the study of gene action. As Caspari has stated:
"Since the possibility of the transfer of genes by an
individual depends on its success in mating, activities
leading to success in mating, as far as they are influenced
by genes, may form a strong component of selective value.
It is for this reason that workers interested in evolution
have carefully studied the influence of particular genes
on sexual behavior and the consequent success in mating"
(Caspari, 1965, pp. 47-48). Indeed, apparently small varia-
tions in mating behavior can have major consequences for
reproductive success. Male rats, for example, normally
effect several discrete insertions prior to ejaculation.
The probability of pregnancy occurring is directly related
to the number of these pre-ejaculatory intromissions a
female receives (Wilson, Adler & LeBoeuf, 1965; Adler,
1969).

Copulatory behavior can also provide an excellent focus
for comparative study in the laboratory. Patterns of copu-
latory behavior show substantial variations among species,
while the pattern within a species tends to be highly
stereotyped. Large individual differences may exist in
quantitative measures, but the general pattern of behavior
for individuals within a species is highly similar. These
highly differentiated species-typical patterns provide good
material for clear-cut comparative analysis.

Copulatory behavior has also been approached as a consummatory response for study under the rubric of motivation. Sex has been viewed as a primary drive, along with hunger and thirst, and a certain amount of research has been published measuring the strength of the sex drive in an obstruction box (e.g., Warner, 1927) and concerning the reward value of copulation in the context of drive-reduction theories (e.g., Sheffield, Wulff & Backer, 1951). Interpretation of a number of the earlier studies of rats suffered from a lack of adequate description of the naturally occurring pattern of copulatory behavior in rats (cf. Stone & Ferguson, 1940).

Beach (1956) clarified several problems involved in the definition and classification of sex as a dirve, and the great bulk of the research since then has been directed toward providing descriptive information on copulatory behavior in the species studied and toward an understanding of the factors governing the temporal patterning of the behavior and of the neural and hormonal mechanisms involved.

While the catalogue of species studied is growing steadily, the species in which copulatory behavior has been most often studied is the laboratory rat, Rattus norvegicus. This is not inappropriate for many of the kinds of research questions one can ask, since the rat is an ideal species for systematic analysis. Large numbers of subjects are readily available, and there is an abundance of data on the effect of

myriad experimental manipulations and on the controls needed in research. Copulatory behavior is stable and reliably reproducible in the laboratory, yet it is sensitive to a wide variety of manipulations. The extensive literature includes some effects of developmental variables, such as early experience (Kagan & Beach, 1953), of physiological interventions, such as cortical ablations (e.g., Larsson, 1962; 1964), and of various drugs (e.g., Whalen & Luttge, 1970; Salis & Dewsbury, 1971) as well as of numerous other kinds of variables.

The remainder of this section will consist of a description of the pattern of copulatory behavior in rats and the measures commonly used in studying it, a review of existing literature on a particular aspect of the behavior-- recovery from sexual satiety, and a statement of the problem to which the present study is addressed.

## Description of Copulatory Behavior in Rats

Laboratory rats display a copulatory pattern involving multiple intromissions, multiple ejaculations, no thrusting during intromissions, and no lock. This is pattern 13 in Dewsbury's classification scheme and is found fairly commonly among muroid rodent species (Dewsbury, 1972).

A male rat given access to a receptive female shows three major copulatory responses, which can be readily distinguished by the observer: mounts, intromissions, and ejaculations. During a mount the male clasps the flanks of

the female with his forepaws and moves his pelvic region in several rapid thrusts without vaginal insertion. This takes less than a second.

An _intromission_ consists of the same palpation with forepaws and shallow pelvic thrusting, but the final, deep thrust achieves vaginal penetration. The penetration lasts a fraction of a second and is terminated by a distinctive forceful, rapid dismount. Intromission is followed by autogenital grooming.

After about 10 intromissions, spaced about 1 min apart, _ejaculation_ occurs. The male mounts, gains vaginal penetration, and displays a spasm of the hindquarters. After ejaculation the male remains quite still for several seconds, tightly clasping the female's flanks. Then he slowly releases his grasp. This completes the first "series"--the group of mounts and intromissions leading up to and including the ejaculation.

A postejaculatory interval of about 5 min elapses before the male once again gives chase and begins a second series which culminates in a second ejaculation. The second ejaculation typically occurs after fewer intromissions than the first, and the intromissions of the second series are usually spaced closer together than those of the first. The postejaculatory period of inactivity increases regularly following each successive ejaculation. With a criterion for satiety of 30 min without an intromission, six or seven

ejaculations are typically found before the male ceases to copulate.

It is convenient to discuss these changes in terms of the standard measures of copulatory behavior. The following is a list of these measures with their definitions: mount latency (ML)--the number of seconds from introduction of the female to the first mount, with or without intromission; intromission latency (IL)--the number of seconds from the introduction of the female to the first intromission; ejaculation latency (EL)--the time in seconds from the first intromission of a series to the ejaculation; mount frequency (MF)--the number of mounts (without intromission) in a series; intromission frequency (IF)--the number of intromissions in a series; the mean interintromission interval (MIII)--the mean interval separating the intromissions of a series, derived by dividing EL by IF; the postejaculatory interval (PEI)--time in seconds from an ejaculation to the first intromission of the next series; and ejaculation frequency (EF)--the number of ejaculations obtained in the test. One further convention will facilitate discussion. The series to which a given measure refers can be denoted by appending the number of that series with a hyphen. For example, IF-2 refers to the number of intromissions in the second series. PEI is designated by the number of the series which it follows. For example, PEI-1 is the postejaculatory interval following the first ejaculation.

The changes that occur over series leading up to sexual exhaustion have been described by Beach and Jordan (1956), Larsson (1956), Dewsbury (1968), and Karen and Barfield (1975). The major feature of this process is a steady lengthening of the PEI with each succeeding series. Changes also occur in EL, MIII, and IF near the beginning and the end of the sessions. EL-2, MIII-2, and IF-2 tend to be less than in the first series, and the decreased values are generally maintained in succeeding series. A dramatic increase is found in EL and MIII in the last series or two before the satiety criterion is reached. A smaller increase is found in late series in IF (Dewsbury, 1968; Karen & Barfield, 1975). Karen and Barfield (1975) further analyzed PEI into two components: an absolutely refractory postejaculatory period and a relatively refractory postejaculatory period following it. Both components were found to increase over series, but at different rates.

## Review of Data on Recovery from Satiety

While the basic copulatory pattern and the changes that occur as satiety approaches have been systematically investigated and well described, this is not the case for the changes that occur as satiety dissipates. Results of early studies provided an outline of the process, but the course of recovery from sexual satiety has not yet been definitively described.

Stone and Ferguson (1940) noted that sexual activity on the second of two successive nights was considerably less than on the first in every rat they observed. "The period for recovery from copulatory satiation is much longer than that for either food or water satiation," they reported. "Data now on hand suggest that from approximately 4 to 6 days (possibly more) are required for recovery from a 2 hour period of unrestricted copulation to the degree that the average copulatory frequency on the second 2 hour period will closely approximate that of the first. The rate of recovery has not yet been fully worked out" (Stone & Ferguson, 1940, pp. 429-430).

In his classic monograph Larsson (1956) reported some observations on recovery from partial satiety. Sexually experienced rats were observed in 1-hr copulatory sessions (1) after one month of rest, (2) after copulating for 1 hr every 4 days for 12 days, (3) after copulating for 1 hr every 3 days for 12 days, and (4) after one month. Each subject was observed under each of these conditions in order. Normally about 50% of the rested males copulating in a 1-hr test achieve five or more ejaculations, thus the 1-hr timed test may be considered very roughly approximate to a test carried out to a criterion of satiety.

Larsson reported that activity in conditions (2) and (3) showed influences of sexual satiation, as compared with conditions (1) and (4). The effect was stronger in the

third condition (copulation every 3 days) than in the second
(copulation every 4 days). The primary change was a great
prolongation of PEI as compared with rested values for the
same series. In another experiment Larsson (1956) observed
the last of five daily 1-hr sessions of copulation. The
increase in PEI was even more pronounced under these con-
ditions. Larsson demonstrated that 14 days were sufficient
for complete recovery from the satiety induced by daily 1-
hr sessions.

In these and other experiments Larsson (1956) found the
general effect of incomplete recovery from satiety or near-
satiety to be (1) great prolongation of PEI, (2) fewer
ejaculations obtained in 1 hr, (3) slight but reliable in-
creases in MIII (measured as decreases in the rate of intro-
mission), (4) a tendency for increase in EL, (5) no change
in IF, and (6) some increases in MF (described as "in-
complete attempts"). Larsson pointed out the similarity
between these changes and those that occur within a session
as satiety develops.

Schwartz (1956) compared an instrumental response (bar-
pressing) and a consummatory response (copulation) as meas-
ures of sexual motivation in tests of fully rested rats and
in tests after different periods of recovery. He stated:
"On the basis of preliminary tests with a group of nonex-
perimental males and the published report of Stone and
Ferguson (1940) it was concluded that six days of rest would

permit full recovery from a session of unlimited copulation and ejaculation" (Schwartz, 1956, p. 324). Schwartz trained 12 male rats to press a bar on a variable-interval schedule of reinforcement to obtain a receptive female for a single intromission. Tests were terminated when sexual satiety occurred as measured by a set of criteria involving both barpress responses and copulatory responses (intromissions), and subjects were retested after 1, 3, and 6 days of recovery. Schwartz found that recovery of the copulatory response varied directly with the length of time allowed for recovery following previous sexual exhaustion. Rate of barpressing was an insensitive measure of sexual recovery but was significantly correlated with changes in the copulatory pattern as satiety approached.

Beach and Jordan (1956) designed a systematic investigation of the course of sexual exhaustion and recovery in the male rat. Whereas Larsson used a timed test and Schwartz used a set of criteria complicated by barpress requirements, Beach and Jordan continued each test until 30 min elapsed without a mount. Whereas Larsson's design made it difficult to assess the degree of exhaustion with which a subject began or ended a test, Beach and Jordan preceded each test with a period thought to allow complete recovery, continued each test to a standard criterion of exhaustion, and tested the same subjects again after specific periods of recovery. Whereas in Schwartz' study the opportunity to

obtain an intromission was contingent upon prior barpress behavior, Beach and Jordan measured ad lib interintromission intervals.

The original design of the Beach and Jordan study involved three satiety tests which occurred after 6 days of rest from previous sexual satiety. One of these tests was followed by a retest after 1 day, while another was followed by a retest after 3 days. Twelve subjects received each of these five tests in different orders.

In the course of the experiment the authors began to suspect that a period of 6 days was not sufficient to allow complete recovery from sexual exhaustion. Accordingly, when the experiment described above was completed, the rats were given a 15-day rest and retested. Half the subjects were then tested again after 1 day, and half tested again after 3 days.

Although they performed no tests of significance, Beach and Jordan presented recovery data for four rest intervals: 1, 3, 6, and 15 days. Like Larsson, they found a decreased EF and longer PEIs in males not fully recovered. Most of their subjects did not copulate after only 1 day of rest since satiety. EL-1 was increased after both 3- and 6-day recovery intervals, but EL in later series did not appear to be different. PEIs for every series were longer after 6 days of rest than after 15 days and longer after 3 days than after 6. "A curve drawn through the median values [of EF]

for days 1, 3, 6, and 15," Beach and Jordan proposed, "would
show that sexual recovery is a negatively accelerated func-
tion and is probably complete at some point between the
tenth and fifteenth days of rest" (Beach & Jordan, 1956, p.
126).

Beach and Jordan's results indicated that the process
of recovery from satiety takes considerably longer than
previously thought. Because of this, their study did not
include observations at all relevant stages of the process,
and the length of the recovery period was not accurately
determined.

In addition, one of the advantages of their design,
mentioned above, was negated by pooling the data from the
two phases of the experiment. In the second phase, 1-day
and 3-day recovery periods were counted from satiety that
was incurred in fully rested animals. In the first phase,
however, tests after 1-day and 3-day recovery intervals were
made following satiety that was incurred in males that had
gained what was apparently only partial recovery from pre-
vious activity (i.e., the satiety session was preceded by
6 rather than 15 days). Larsson found, under the conditions
of his procedures, an intensification of the satiation ef-
fects with repeated testing, as described above. It is not
known to what extent, if at all, sexual exhaustion may accu-
mulate when tests are continued to a criterion of exhaustion
and complete recovery is not allowed between repeated tests.
We cannot be sure, therefore, that the level of

satiety from which recovery was measured was controlled in the Beach and Jordan experiment.

The lack of statistical tests was another feature which limited the comparative value of their report. Their study did establish, however, that a period of 15 days is at least sufficient for full recovery of baseline levels of behavior, and in the 19 years since this classic study appeared, researchers planning experiments have routinely alllowed 14-15 days for recovery from sexual satiety in the male rat.

Some confirmation of Beach and Jordan's results was supplied in a recent study of sexual satiety in the rat (Karen & Barfield, 1975). Karen and Barfield gave recovery tests 3 days after satiety and 6 days after satiety, with the satiety session preceding each test preceded by 2 weeks of rest since previous activity. They found an influence of satiety on EF and PEI still present after 6 days, but they did not measure intervals between 6 days and 2 weeks.

Such an extended period of recovery from satiety con- stitutes an interesting phenomenon, in that few biological systems of this sort require so long a period to recover from use. It is difficult to see how depletion of resources in a satiety test can be so great that two weeks without sexual activity is required to reinstate rested levels of behavior.

The closest-related species for which recovery data are available, the golden hamster (<u>Mesocricetus auratus</u>),

appears to attain complete recovery from sexual satiety
within 5 days (Beach & Rabedeau, 1959). A number of
characteristics of the copulatory pattern in hamsters are
quite similar to the pattern in rats. Hamsters show the
same combination of key features--multiple intromissions,
multiple ejaculations, no thrusting during intromission,
and no lock--which define pattern 13 in Dewsbury's classi-
fication system (Dewsbury, 1972). Like rats, hamsters show
a decrease in IF and MIII after the first series, and an
increase over series in PEI. Beach and Rabedeau found that
while hamsters tend to copulate at a faster rate than
rats (shorter MIII and PEIs) and they achieve a greater
number of ejaculations (EF = 9), they still appear to
obtain full recovery from satiety much faster than rats
(about 5 days). This comparison, while it affords no basis
for conclusions, serves to emphasize the question why the
process of recovery from sexual satiety in male rats should
require so long a period.

## The Present Study

It is clear that a more detailed determination of the
course of recovery from sexual satiety is warranted. Such
a determination will be directly relevant to an understanding
of the satiety process and hence to any theoretical attempt
to explain it. The information will also be of considerable
practical value for experimenters using satiety tests in

studies of the effect of hormones, drugs, brain lesions or other physiological interventions, or any other experimental manipulations on sex behavior in rats.

The present experiment was undertaken as a normative study, to chart precisely the course of recovery from sexual satiety in male rats (Rattus norvegicus).  All tests were continued to a criterion of satiety, 30 min without an intromission, the standard criterion currently used by most investigators.  Because of great individual differences but relatively stable intraindividual patterns, this experiment, like previous studies, employed a within-subjects design.  Each subject was tested after six different periods of recovery from satiety, particularly in the interval in which Beach and Jordan suggested that recovery becomes complete.  In order to standardize the level of satiety from which recovery was measured, subjects were allowed complete recovery from previous activity and then satiated prior to each recovery test.

# METHOD

## Subjects

The subjects were 24 male Long-Evans rats. They were
selected, according to the criteria given below, from a
pool of 32 males with no prior copulatory experience. The
rats were purchased at the age of 80 days from Blue Spruce
Farms, Altamont, New York. They were a mean of 98 days old
at the time of the first satiety session, and 240 days old
at the time of the last test.

Subjects were housed individually in 17.8 x 25.4 x
17.8 cm Wahmann hanging cages in the room in which they
were tested. A 12:12 hr reversed light-dark cycle pre-
vailed, with lights off at 1100 hr and on at 2300 hr.
Purina Lab Chow and water were continuously available.

Forty-eight females of the same age and strain were
maintained in group cages in the same room and were fed the
same diet. Eight groups of six females were rotated for
use in mating tests throughout the experiment.

## Apparatus

Four cylindrical plexiglass arenas, 66 cm high and 84
cm in diameter, were used for observing copulatory behavior.
These were placed on wooden platforms, and the floor covered

with absorbent litter material.  Observations were recorded
manually on an Esterline-Angus event recorder.

## Procedure

Preliminary handling.--At approximately 80 days of
age, males were earpunched for identification.  On each of
the next five days each male was allowed to remain alone
in an observation arena for 10-15 min.

Test procedures.--Tests were conducted in dim light
during the last third of the dark phase of the (reversed)
light cycle.  Each male was given 3-5 min in the arena be-
fore a female was introduced.  In satiety tests males
copulated ad lib to the satiety criterion of 30 min without
intromission.  In the event that no intromission occurred
in the first 15-20 min of the test, the test was terminated.

Females were brought into behavioral estrus for copu-
latory tests through intramuscular injections of 0.1 mg
estradiol benzoate in oil approximately 75 hr before testing
and 1.0 mg progesterone in oil 3-4 hr before testing.  Only
those females exhibiting good receptivity when checked with
a nonexperimental male immediately before a test were used
in actual testing.

Pretesting.--Pretesting was begun after completion of
preliminary handling.  Each male was given one to three
opportunities to mate with a receptive female.  Pretests
were terminated after the second ejaculation or after 15
min if copulation did not take place.  A male that did not

achieve intromission within 15 min was given a second pre-
test two days later. Some of those that failed to copulate
both times were given a third opportunity several days
later.

In this way 24 males were selected as subjects on the
basis of having demonstrated successful copulation. Each
subject then was allowed to copulate to satiety two weeks
prior to the start of the experiment in order to insure
stabilization of the effects of experience.

Design of the experiment.--Copulatory behavior was ob-
served after various periods of recovery from sexual exhaus-
tion. The exhaustion from which recovery was measured was
established in a nonexperimental satiety session preceding
each experimental test. Thus, each experimental condition
actually involved two sessions--one to establish satiety and
the other, a certain number of days later, to measure re-
covery.

The experimental tests were conducted after 3, 6, 9,
11, 13, or 15 days of recovery. Each subject was tested
under each of these conditions. Subsequent to the initial
satiety experience, each subject copulated to satiety 12
times in the course of the experiment. The experimental
tests and the satiety sessions preceding them were identical
in every respect except for the length of the rest interval
since previous sexual activity. The period elapsing after
a test before the nonexperimental satiety session preceding

the next test was the standard two-week period normally allowed for full recovery from satiety.

Six groups of four subjects received the six experimental conditions in different orders. A randomly selected 6 x 6 Latin square provided a randomized, counterbalanced running order, so that each condition appeared first for one group, second for another, and so on (Winer, 1972, p. 693). The actual orders used appear in Table 1.

A running schedule was devised to fulfill the requirements of the six groups in such a way that all 312 satiety tests were conducted in the space of five months.

Table 1

Running Orders

| Group | Test | | | | | |
|-------|------|------|------|------|------|------|
|       | 1st  | 2nd  | 3rd  | 4th  | 5th  | 6th  |
| A     | 3    | 11   | 13   | 6    | 9    | 15   |
| B     | 15   | 9    | 6    | 13   | 11   | 3    |
| C     | 9    | 15   | 11   | 3    | 13   | 6    |
| D     | 11   | 6    | 15   | 9    | 3    | 13   |
| E     | 6    | 13   | 3    | 111  | 15   | 9    |
| F     | 13   | 3    | 9    | 15   | 6    | 11   |

Note.  Entries are the six experimental conditions, repre-
senting days of recovery from sexual satiety.  Each test
was preceded by a nonexperimental satiety session.

# RESULTS

For three measures, EF, ML, and IL, data consisted of one score per subject per session. For the remaining measures, MF, IF, EL, MIII, and PEI, data consisted of one score per subject per series in each session. Since subjects completed varying numbers of series before reaching satiety, not all the data could be analyzed in a within-subjects design. Three series were the maximum that could be analyzed in this experiment with all subjects and tests represented. Data were analyzed for 18 subjects for which data were essentially complete to a minimum of three ejaculations on each test. Of the original 24 subjects, four died before completion of the experiment, and two others had occasional negative tests resulting in a prohibitive number of missing data points.

All measures except ML and IL were subjected to least squares analyses of variance with repeated measures, yielding $F$ ratios for the effect due to groups (representing running orders), for recovery interval, and for the groups-by-recovery interaction (Barr & Goodnight, 1972; Cohen, 1968). Individual comparisons were made using the ratio of the difference between means to the standard error of the difference (Winer, 1971, p. 603; Bruning & Kintz, 1968, p. 113).

## Ejaculation Frequency

Mean EF values for each recovery interval are given in Table 2. Subjects attained fewer ejaculations after both the 3-day period and the 6-day period than after longer intervals, but only the Day 3 EF was significantly different, at least at the .05 level, from the Day 15 value (Table 2). These individual comparisons were made following an analysis of variance that showed a significant difference among recovery intervals (Table 3), but the analysis showed no differences among groups in the number of ejaculations achieved and no difference among groups in the effect of a given recovery interval on EF (groups-by-recovery interaction).

## Mount Latency and Intromission Latency

The distributions of both ML and IL were extremely skewed. Most subjects took only a few seconds to begin copulation, but occasionally much longer latencies were recorded, up to the maximum of 900 sec imposed by the 15-min time limit. Table 4 gives medians, means, and standard errors for these two measures. The departure from normality of the distributions can be appreciated from the discrepancy between medians and means and from the size and heterogeneity of the standard errors of the means.

The scores for both ML and IL, therefore, were analyzed using the Friedman test, a two-way analysis of variance by ranks (Conover, 1971). A significant difference among recovery intervals was found in ML, but not in IL (Table 4).

Table 2

Ejaculation Frequency--Medians,
Means, and Standard Errors

| Days of Recovery | Median | Mean | s.e. |
|---|---|---|---|
| 3 | 4.3 | 4.1[a] | 0.4 |
| 6 | 5.7 | 5.9 | 0.4 |
| 9 | 6.5 | 6.7 | 0.4 |
| 11 | 6.5 | 6.4 | 0.6 |
| 13 | 6.3 | 6.3 | 0.4 |
| 15 | 6.2 | 6.3 | 0.5 |

Note. $n = 18$.

[a]Differs from Day 15, $p < .001$; $\underline{t}$ test.

Table 3

Ejaculation Frequency--Summary
of Analysis of Variance

| Source | Sum of Squares | df | Mean Square | $F$ | $p$ |
|---|---|---|---|---|---|
| Regression | 299.88 | 47 | | | |
| Groups | 35.05[a] | 5 | 7.01 | <1 | NS |
| Subjects within groups | 115.41[a] | 12 | 9.62 | | |
| Recovery | 78.84[a] | 5 | 15.77 | 6.12 | <.001 |
| Groups x Recovery | 71.96[a] | 25 | 2.88 | 1.12 | NS |
| Error within | 154.67 | 60 | 2.58 | | |
| Corrected total | 454.55 | 107 | | | |

[a]Corrected (partial) sum of squares.

Table 4

Latencies (in seconds) To Begin Copulation--
Medians, Means, and Standard Errors

| Days of Recovery | Mount Latency[a] | | | Intromission Latency[b] | | |
|---|---|---|---|---|---|---|
| | Median | Mean | s.e. | Median | Mean | s.e. |
| 3 | 13.0[c] | 22.7 | 7.0 | 20.5 | 58.4 | 18.9 |
| 6 | 11.0 | 11.7 | 1.3 | 17.5 | 22.2 | 3.7 |
| 9 | 11.1 | 47.3 | 37.2 | 13.2 | 67.7 | 49.1 |
| 11 | 11.5 | 10.7 | .6 | 15.5 | 44.1 | 23.8 |
| 13 | 11.2 | 11.2 | .8 | 16.5 | 56.2 | 33.6 |
| 15 | 10.0 | 10.7 | .9 | 13.0 | 19.0 | 4.0 |

Note.  n = 18.

[a]$\underline{T}$ = 12.8, $\underline{p}$ < .025, Friedman test.

[b]$\underline{T}$ = 7.3 (NS), Friedman test.

[c]Different from Day 15 scores, $\underline{T}$ = 8.0, $\underline{p}$ < .005; Friedman test.

Individual comparisons were made by further application of
the Friedman test to the data for the recovery intervals
being compared (Conover, 1971). Of the 18 subjects, 14 had
longer latencies to the first mount in the test after the
3-day recovery interval than they did after 15 days. This
difference in ML after 3 and 15 days of recovery was statis-
tically significant, while the remaining comparisons (with
Day 15) were not significant (Table 4).

## Mount Frequency

Table 5 shows the mean mount frequencies for the first
three series in tests after different periods of recovery
from satiety. MF-2 and MF-3 were greater after 3 days of
recovery than they were after longer recovery periods. The
significant differences between 3-day and 15-day values for
MF-2 and MF-3 are indicated in Table 5. Table 6 gives the
analyses of variance for these measures.

The analysis of MF-1 showed that the number of mounts
occurring in the first series did not change with different
recovery intervals (Table 6). Even though the mean MF for
the first series of the test after a 3-day period of re-
covery was greater than after other periods (Table 5), this
apparently did not reflect a consistent trend within
subjects.

## Intromission Frequency

The number of intromissions obtained in a given series
was extremely stable. Means for tests after 3 days of

Table 5

Mount Frequency, Series 1, 2, and 3--
Means and Standard Errors

| Days of Recovery | MF-1 | | MF-2 | | MF-3 | |
|---|---|---|---|---|---|---|
| | M | s.e. | M | s.e. | M | s.e. |
| 3 | 8.7 | 1.8 | 5.2[a] | 1.1 | 6.5[b] | 2.2 |
| 6 | 5.0 | 0.9 | 2.4 | 0.8 | 3.4 | 1.1 |
| 9 | 5.1 | 0.9 | 2.1 | 0.6 | 3.6 | 1.0 |
| 11 | 5.0 | 0.9 | 2.7 | 0.6 | 4.6 | 1.5 |
| 13 | 6.1 | 1.6 | 1.9 | 0.5 | 1.9 | 0.7 |
| 15 | 6.2 | 1.8 | 3.1 | 1.0 | 1.9 | 0.6 |

Note. n = 18.

[a]Different from Day 15, $p$ < .05; $t$ test.

[b]Different from Day 15, p < .01; $t$ test.

Table 6

Mount Frequency, Series 1, 2, and 3--Summary
of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| | | MF-1 | | | |
| Regression | 2,124.87 | 47 | | | |
| Groups | 597.20[a] | 5 | 119.44 | 1.58 | NS |
| Subjects within groups | 909.47[a] | 12 | 75.79 | | |
| Recovery | 191.59[a] | 5 | 38.32 | 1.47 | NS |
| Groups X Recovery | 435.86[a] | 25 | 17.43 | <1 | NS |
| Error within | 1,560.12 | 60 | 26.00 | | |
| Corrected total | 3,684.99 | 107 | | | |
| | | MF-2 | | | |
| Regression | 759.97 | 47 | | | |
| Groups | 87.33[a] | 5 | 17.47 | <1 | NS |
| Subjects within groups | 331.39[a] | 12 | 27.62 | | |
| Recovery | 136.59[a] | 5 | 27.32 | 3.78 | <.005 |
| Groups X Recovery | 217.76[a] | 25 | 8.71 | 1.21 | NS |
| Error within | 433.11 | 60 | 7.21 | | |
| Corrected total | 1,193.07 | 107 | | | |
| | | MF-3 | | | |
| Regression | 1,909.29 | 47 | | | |
| Groups | 43.71[a] | 5 | 43.71 | <1 | NS |
| Subjects within groups | 49.65[a] | 12 | 49.65 | | |
| Recovery | 74.75[a] | 5 | 74.75 | 3.06 | <.02 |
| Groups X Recovery | 33.40[a] | 25 | 33.40 | 1.37 | NS |
| Error within | 1,464.71 | 60 | 24.41 | | |
| Corrected total | 3,374.00 | 107 | | | |

[a]Corrected (partial) sum of squares.

recovery (Table 7) suggest not the slightest influence of previous satiety. Analyses of variance for IF-1, IF-2, and IF-3 (Table 8) yielded no significant effect due to recovery intervals.

## Ejaculation Latency

Increases in the time required to achieve ejaculation were found after a 3-day period of recovery for each of the first three series. Lengthening of EL was perhaps more pronounced in Series 2 and 3 than in the first series, but comparisons of Day 3 with Day 15 for all three series were statistically significant (Table 9). These comparisons were made following a significant effect due to recovery interval in analyses of variance for each measure (Table 10).

## Mean Interintromission Interval

The average interval between intromissions was calculated for each series of each session for each subject. Mean MIIIs over subjects for each recovery interval are shown in Table 11. MIII showed the same general pattern of differences that was seen in MF. The analyses of variance (Table 12) demonstrated a significant recovery interval effect on MIII-2 and MIII-3, but not on the spacing of intromissions in the first series. Individual comparisons of recovery intervals showed MIII-2 and MIII-3 after 3 days of recovery to be significantly longer than after 15 days (Table 11).

Table 7

Intromission Frequency, Series 1, 2, and 3--
Means and Standard Errors

| Days of Recovery | IF-1 | | IF-2 | | IF-3 | |
|---|---|---|---|---|---|---|
| | M | s.e. | M | s.e. | M | s.e. |
| 3 | 10.3 | 0.7 | 5.4 | 0.5 | 5.1 | 0.5 |
| 6 | 10.6 | 0.8 | 5.1 | 0.3 | 4.9 | 0.4 |
| 9 | 10.3 | 0.6 | 5.2 | 0.4 | 4.9 | 0.5 |
| 11 | 10.2 | 0.8 | 5.3 | 0.6 | 5.4 | 0.6 |
| 13 | 9.5 | 0.8 | 4.7 | 0.3 | 5.2 | 0.4 |
| 15 | 10.8 | 0.9 | 4.6 | 0.3 | 4.7 | 0.3 |

Note.  n = 18.

Table 8

Intromission Frequency, Series 1, 2, and 3--
Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| | | IF-1 | | | |
| Regression | 769.04 | 47 | | | |
| Groups | 106.01[a] | 5 | 21.20 | <1 | NS |
| Subjects within groups | 461.36[a] | 12 | 38.45 | | |
| Recovery | 11.85[a] | 5 | 2.37 | <1 | NS |
| Groups X Recovery | 178.25[a] | 25 | 7.13 | 1.22 | NS |
| Error within | 341.06 | 60 | 5.85 | | |
| Corrected total | 1,120.10 | 107 | | | |
| | | IF-2 | | | |
| Regression | 168.61 | 47 | | | |
| Groups | 22.43[a] | 5 | 4.49 | <1 | NS |
| Subjects within groups | 70.59[a] | 12 | 5.88 | | |
| Recovery | 10.96[a] | 5 | 2.19 | <1 | NS |
| Groups X Recovery | 66.17[a] | 25 | 2.65 | 1.07 | NS |
| Error within | 148.16 | 60 | 2.47 | | |
| Corrected total | 316.77 | 107 | | | |
| | | IF-3 | | | |
| Regression | 166.25 | 47 | | | |
| Groups | 22.47 | 5 | 4.49 | <1 | NS |
| Subjects within groups | 74.87 | 12 | 6.24 | | |
| Recovery | 6.72 | 5 | 1.34 | <1 | NS |
| Groups X Recovery | 63.09 | 25 | 2.52 | <1 | NS |
| Error within | 193.71 | 60 | 3.23 | | |
| Corrected total | 359.96 | 107 | | | |

[a]Corrected (partial) sum of squares.

Table 9

Ejaculation Latency (in seconds), Series
1, 2, and 3--Means and Standard Errors

| Days of Recovery | EL-1 | | EL-2 | | EL-3 | |
|---|---|---|---|---|---|---|
| | M | s.e. | M | s.e. | M | s.e. |
| 3 | 440.8[a] | 62.8 | 370.1[b] | 81.2 | 403.4[b] | 87.8 |
| 6 | 268.4 | 22.2 | 147.1 | 14.5 | 181.5 | 25.3 |
| 9 | 329.9 | 32.8 | 149.3 | 17.0 | 186.7 | 39.3 |
| 11 | 280.8 | 25.9 | 163.2 | 25.7 | 260.2 | 68.6 |
| 13 | 375.8 | 77.6 | 140.6 | 17.7 | 151.1 | 19.8 |
| 15 | 318.7 | 35.8 | 134.7 | 16.0 | 133.5 | 19.9 |

Note. $n = 18$.

[a]Differs from Day 15, $\underline{p} < .05$.

[b]Differs from Day 15, $\underline{p} < .001$.

Table 10

Ejaculation Latency, Series 1, 2, and 3--
Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | $F$ | $p$ |
|---|---|---|---|---|---|
| | | EL-1 | | | |
| Regression | 2,816,423.08 | 47 | | | |
| Groups | 578,767.36[a] | 5 | 115,753.47 | 1.05 | NS |
| Subjects within groups | 1,326,887.58[a] | 12 | 110,573.97 | | |
| Recovery | 405,258.01[a] | 5 | 81,051.60 | 2.90 | <.02 |
| Groups x Recovery | 534,668.85[a] | 25 | 21,386.75 | < 1 | NS |
| Error within | 1,676,439.17 | 60 | 27,940.65 | | |
| Corrected total | 4,492,862.25 | 107 | | | |
| | | EL-2 | | | |
| Regression | 1,899,631.79 | 47 | | | |
| Groups | 37,349.99[a] | 5 | 7,470.00 | < 1 | NS |
| Subjects within groups | 751,409.22[a] | 12 | 62,617.44 | | |
| Recovery | 717,556.90[a] | 5 | 143,511.38 | 5.95 | <.001 |
| Groups x Recovery | 355,884.27[a] | 25 | 14,235.37 | < 1 | NS |
| Error within | 1,446,910.53 | 60 | 24,115.18 | | |
| Corrected total | 3,346,542.32 | 107 | | | |
| | | EL-3 | | | |
| Regression | 3,156,839.14 | 47 | | | |
| Groups | 44,902.84[a] | 5 | 8,980.57 | < 1 | NS |
| Subjects within groups | 1,501,351.40[a] | 12 | 125,112.62 | | |
| Recovery | 994,954.59[a] | 5 | 198,990.92 | 4.88 | <.001 |
| Groups x Recovery | 724,580.11[a] | 25 | 28,983.20 | < 1 | NS |
| Error within | 2,446,291.10 | 60 | 40,771.52 | | |
| Corrected total | 5,603,130.25 | 107 | | | |

[a]Corrected (partial) sum of squares.

Table 11

Mean Interintromission Interval (in seconds), Series
1, 2, and 3--Means and Standard Errors

| Days of Recovery | MIII-1 | | MIII-2 | | MIII-3 | |
|---|---|---|---|---|---|---|
| | M | s.e. | M | s.e. | M | s.e. |
| 3 | 44.8 | 6.5 | $55.5^a$ | 7.3 | $78.3^a$ | 13.1 |
| 6 | 26.1 | 1.7 | 29.4 | 2.6 | 38.5 | 4.8 |
| 9 | 33.0 | 3.7 | 28.8 | 2.6 | 36.0 | 5.0 |
| 11 | 30.9 | 5.3 | 32.7 | 5.3 | 42.8 | 7.4 |
| 13 | 36.3 | 5.1 | 29.4 | 3.1 | 31.5 | 5.7 |
| 15 | 43.8 | 14.1 | 27.2 | 3.5 | 29.7 | 4.8 |

Note.  n = 18.

[a]Differs from Day 15, $p$ < .001; $t$ test.

Table 12

Mean Interintromission Interval (in seconds),
Series 1, 2, and 3--Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| | | MIII-1 | | | |
| Regression | 55,566.38 | 47 | | | |
| Groups | 2,245.43[a] | 5 | 449.09 | < 1 | NS |
| Subjects within groups | 35,557.82[a] | 12 | 2,963.15 | | |
| Recovery | 4,458.22[a] | 5 | 891.64 | 1.22 | NS |
| Groups x Recovery | 12,839.44[a] | 25 | 513.58 | < 1 | NS |
| Error within | 43,902.03 | 60 | 731.70 | | |
| Corrected total | 99,468.41 | 107 | | | |
| | | MIII-2 | | | |
| Regression | 33,240.07 | 47 | | | |
| Groups | 926.59[a] | 5 | 185.32 | < 1 | NS |
| Subjects within groups | 14,882.23[a] | 12 | 1,240.19 | | |
| Recovery | 10,886.56[a] | 5 | 2,177.31 | 10.58 | <.0001 |
| Groups x Recovery | 7,095.85[a] | 25 | 283.83 | 1.38 | NS |
| Error within | 12,343.08 | 60 | 205.72 | | |
| Corrected total | 45,583.16 | 107 | | | |
| | | MIII-3 | | | |
| Regression | 78,680.09 | 47 | | | |
| Groups | 877.84[a] | 5 | 175.57 | < 1 | NS |
| Subjects within groups | 35,411.31[a] | 12 | 2,950.94 | | |
| Recovery | 30,624.80[a] | 5 | 6,124.96 | 7.12 | <.0001 |
| Groups x Recovery | 13,278.97[a] | 25 | 531.16 | < 1 | NS |
| Error within | 51,592.39 | 60 | 859.87 | | |
| Corrected total | 130,272.48 | 107 | | | |

[a]Corrected (partial) sum of squares.

## Postejaculatory Interval

PEI-1.--The length of the refractory period following the first ejaculation was significantly longer on Day 3 than on Day 15 (Table 13), while the corresponding comparisons for 6, 9, and 11 days were not different from 15 days. PEI-1 was, however, significantly longer after 13 days than after 15 (Table 13). The variability at this point (standard error of the mean = 55.7 sec for tests after 13 days) was also considerably greater than for other rest intervals. Scrutiny of individual records for that recovery interval revealed that the unusually high mean of 369.7 sec was primarily due to one typically high-scoring subject whose PEI after the first ejaculatory series in this test was 510 sec, an atypically high value even for him. In fact, 9 of the 18 subjects had longer first series PEIs on the Day 15 test than they did on the Day 13 test. When the Friedman test was applied to these data, it resulted in a $T$ = 0.056, which is not significant.

PEI-2.--The PEI following the second ejaculation increased steadily with decrease in the length of the recovery interval, and the analysis of variance indicated this association was significant (Table 14). PEI-2 values after 3 days, 6 days, and 9 days of recovery were each significantly different from PEI-2 after 15 days (Table 13).

Measures of behavior beyond the third ejaculation were not included for analysis. Since PEI-3 extends to the

Table 13

Postejaculatory Interval, Series 1 and 2--
Medians, Means, and Standard Errors

|  | PEI-1 | | | PEI-2 | | |
|---|---|---|---|---|---|---|
|  | Median | Mean | s.e. | Median | Mean | s.e. |
| 3 | 461.5 | 473.2[a] | 23.2 | 593.5 | 639.0[a] | 42.3 |
| 6 | 336.5 | 320.2 | 12.1 | 413.0 | 409.0[a] | 11.8 |
| 9 | 313.5 | 310.7 | 10.1 | 390.0 | 394.4[a] | 16.4 |
| 11 | 299.0 | 299.1 | 12.6 | 365.5 | 378.0 | 16.6 |
| 13 | 297.0 | 369.7[b] | 55.7 | 362.5 | 301.8 | 10.3 |
| 15 | 291.0 | 301.8 | 10.3 | 382.5 | 368.8 | 13.9 |

Note. n = 18.

[a]Differs from Day 15, $p$ < .001, $t$ test.

[b]Differs from Day 15, $p$ < .05, $t$ test.

Table 14

Postejaculatory Interval, Series 1 and 2--
Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| | | PEI-1 | | | |
| Regression | 1,084,150.38 | 47 | | | |
| Groups | 78,368.70[a] | 5 | 15,673.74 | < 1 | NS |
| Subjects within groups | 337,575.50[a] | 12 | 28,131.29 | | |
| Recovery | 367,732.11[a] | 5 | 73.546.42 | 7.38 | <.0001 |
| Groups x Recovery | 256,219.47[a] | 25 | 10,248.78 | 1.03 | NS |
| Error within | 597.870.83 | 60 | 9,964.51 | | |
| Corrected total | 1,682.021.21 | 107 | | | |
| | | PEI-2 | | | |
| Regression | 1,490,404.96 | 47 | | | |
| Groups | 7,587.24[a] | 5 | 1,517.45 | < 1 | NS |
| Subjects within groups | 392,019.87[a] | 12 | 32,668.32 | | |
| Recovery | 955,130.21[a] | 5 | 191,026.04 | 30.49 | <.0001 |
| Groups x Recovery | 99,085.49[a] | 25 | 3,963.42 | < 1 | NS |
| Error within | 375,956.71 | 60 | 6,265.95 | | |
| Corrected total | 1,866,361.67 | 107 | | | |

[a]Corrected (partial) sum of squares.

beginning of the fourth series, it did not exist for all subjects on every test.

In summary, rats tested after 3 days of recovery from sexual satiety obtained fewer ejaculations but showed no influence of prior satiety on the latency to the first intromission, nor on the number of mounts, the number of intromissions, or the average interval between intromissions, in the first series. The latency to the first mount, the latency to achieve the first ejaculation, and the first postejaculatory interval were significantly longer in the Day 3 test than after 15 days of recovery. In the second and third series, IF was again unaffected, but MF, EL, and MIII were all significantly longer on Day 3 than on Day 15, as was PEI-2.

After 6 days of recovery, EF was found to be somewhat less than after 15 days, but not significantly so. Recovery was complete on Day 6 in terms of every other measure except PEI-2, which was significantly longer on both Day 6 and Day 9 than on Day 15.

Supplementary Analyses

Data from the set of fully rested satiety sessions which preceded each test were examined for changes over time, since by the end of the experiment, subjects were five months older and considerably more experienced. The first time the subjects copulated to satiety was during the pretesting period, two weeks prior to the satiety

session which preceded the first test. This initial session was included for analysis. Thus a total of seven sessions were analyzed.

Each measure was subjected to an analysis of variance similar to those reported above for recovery data. Summaries of these analyses appear in the Appendix. Means for each session are given in Tables 15 to 20. The strongest effect was in EF, which decreased steadily with time (Table 15). This relationship was significant ($F$ = 9.30, $df$ = 6,102; $p$ < .001). Every other measure showed an increase in value (great or slight) between the next-to-last and the last session and, in some cases, also between the ante-penultimate and the penultimate. The measures for which test number constituted a significant effect, besides EF, were EL-1 and EL-2 (in both cases $F$ = 2.30, $df$ = 6,102; $p$ < .05), MF-2 ($F$ = 2.40, $df$ = 6,102; $p$ < .05), MIII-2 ($F$ = 2.26, $df$ = 6,102; $p$ < .05), and MIII-3 ($F$ = 2.76, $df$ = 6,102; $p$ < .05). Analysis of IF-1 also resulted in a significant difference among sessions ($F$ = 2.72, $df$ = 6,102; $p$ < .05), but in this case the pattern of differences was not the same as that which the other measures showed. The other measures for which a significant difference was found showed relatively consistent values for the first six sessions, then an increase in the session preceding the last experimental test. The exception to this finding was EF, which decreased regularly from the first to the last

Table 15

Ejaculation Frequency--Means and Standard
Errors for Seven Satiety Sessions

|      |     |     | Session |     |     |     |     |
|------|-----|-----|---------|-----|-----|-----|-----|
|      | 1   | 2   | 3       | 4   | 5   | 6   | 7   |
| Mean | 8.7 | 7.5 | 7.2     | 7.1 | 6.4 | 6.1 | 5.6 |
| s.e. | 0.5 | 0.5 | 0.5     | 0.3 | 0.3 | 0.4 | 0.6 |

Note.  n = 18.

Table 16

Postejaculatory Interval, Series 1 and 2--Means
and Standard Errors for Seven Satiety Sessions

|         |      |       |       | Session |       |       |       |       |
|---------|------|-------|-------|---------|-------|-------|-------|-------|
|         |      | 1     | 2     | 3       | 4     | 5     | 6     | 7     |
| PEI-1   | M    | 326.1 | 303.2 | 293.3   | 300.1 | 287.7 | 313.3 | 368.7 |
|         | s.e. | 10.7  | 9.0   | 6.7     | 13.3  | 41.8  | 11.5  | 50.9  |
| PEI-2   | M    | 388.8 | 380.8 | 386.4   | 381.5 | 358.1 | 359.2 | 403.9 |
|         | s.e. | 10.5  | 17.5  | 16.6    | 20.3  | 11.1  | 13.0  | 23.1  |

Note.  n = 18.

Table 17

Ejaculation Latency, Series 1, 2, and 3--Means
and Standard Errors for Seven Satiety Sessions

|  |  | Session | | | | | | |
|---|---|---|---|---|---|---|---|---|
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| EL-1 | M | 344.4 | 368.9 | 295.9 | 304.2 | 302.9 | 395.4 | 489.6 |
|  | s.e. | 40.3 | 76.6 | 27.4 | 45.7 | 31.3 | 46.8 | 85.6 |
| EL-2 | M | 142.1 | 163.0 | 144.1 | 156.2 | 129.1 | 147.8 | 224.3 |
|  | s.e. | 10.1 | 40.3 | 16.2 | 32.1 | 18.3 | 12.8 | 36.5 |
| EL-3 | M | 236.8 | 177.0 | 224.6 | 138.2 | 150.0 | 177.9 | 376.8 |
|  | s.e. | 94.0 | 52.3 | 46.3 | 15.8 | 19.2 | 32.7 | 133.2 |

Note. n = 18.


Table 18

Mount Frequency, Series 1, 2, and 3--Means and
Standard Errors for Seven Satiety Sessions

|  |  | Session | | | | | | |
|---|---|---|---|---|---|---|---|---|
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| MF-1 | M | 4.8 | 3.6 | 3.8 | 4.3 | 4.3 | 5.8 | 6.3 |
|  | s.e. | 1.0 | 0.6 | 0.6 | 0.8 | 0.7 | 0.9 | 1.7 |
| MF-2 | M | 1.6 | 1.8 | 2.1 | 1.8 | 1.8 | 2.2 | 3.9 |
|  | s.e. | 0.5 | 0.5 | 0.5 | 0.6 | 0.4 | 0.4 | 0.8 |
| MF-3 | M | 4.4 | 1.9 | 3.9 | 2.0 | 2.1 | 2.1 | 7.9 |
|  | s.e. | 2.8 | 0.5 | 1.1 | 0.4 | 0.5 | 0.6 | 3.4 |

Note. n = 18.

Table 19

Intromission Frequency, Series 1, 2, and 3--Means
and Standard Errors for Seven Satiety Sessions

| | | Session | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| IF-1 | M | 12.7 | 11.7 | 11.0 | 9.4 | 10.4 | 11.0 | 11.1 |
| | s.e. | 1.1 | 1.0 | 0.8 | 0.7 | 0.8 | 1.1 | 0.8 |
| IF-2 | M | 5.3 | 5.1 | 5.3 | 4.7 | 5.0 | 5.3 | 5.6 |
| | s.e. | 0.3 | 0.3 | 0.5 | 0.4 | 0.3 | 0.4 | 0.4 |
| IF-3 | M | 6.5 | 5.2 | 5.9 | 5.0 | 5.0 | 5.7 | 6.7 |
| | s.e. | 1.0 | 0.4 | 0.6 | 0.4 | 0.4 | 0.8 | 1.2 |

Note.  n = 18.

Table 20

Mean Interintromission Interval, Series 1, 2, and 3--
Means and Standard Errors for Seven Satiety Sessions

| | | Session | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| MIII-1 | M | 27.2 | 35.1 | 28.5 | 34.1 | 29.0 | 34.9 | 44.6 |
| | s.e. | 2.9 | 8.8 | 3.3 | 5.7 | 2.1 | 3.3 | 7.0 |
| MIII-2 | M | 27.5 | 30.5 | 27.1 | 31.7 | 27.1 | 29.2 | 39.3 |
| | s.e. | 2.2 | 4.8 | 1.6 | 3.8 | 2.2 | 2.5 | 5.7 |
| MIII-3 | M | 30.9 | 31.8 | 37.9 | 27.6 | 30.7 | 31.1 | 56.7 |
| | s.e. | 4.2 | 5.8 | 7.3 | 2.6 | 3.6 | 2.9 | 14.2 |

Note.  n = 18.

session.  IF-1, on the other hand, was higher in the initial
session than at other times and dropped to a lower value
for the fourth session, in the middle of the experiment
(Table 20).

DISCUSSION

The primary objective of this study was to determine
how long the effects of sexual satiation on subsequent copu-
latory behavior persist in male rats. This objective was
fulfilled and represents the first accurate determination of
recovery from satiety in rats. Results of this study indi-
cate that recovery from satiety is complete, as measured by
every index, at least 4 days sooner than the 15 days in-
vestigators have customarily allowed. In fact, all measures
of behavior from the inital mount up through the second
ejaculation recovered their baseline values in this study
by the sixth day after satiety. The pattern of recovery
for each measure is summarized in Table 21.

Different measures recovered at different rates. As
the table makes clear, recovery from satiety is a function
of the measure used to define it. Ordinarily one would not
wish to ascribe complete recovery to an animal which showed
residual effects of satiety in any measure of copulatory
behavior. By this criterion the earliest we can call re-
covery complete is after 11 days of rest. But there might
well be practical instances in which only the within-series
data (excluding PEI) of the first two or three series would
be of interest. In these cases, copulation could be resumed

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Table 21

Recovery from Sexual Satiety in 17
Measures of Copulatory Behavior

| | Days of Recovery | | | | | |
|---|---|---|---|---|---|---|
| Measure | 3 | 6 | 9 | 11 | 13 | 15 |
| ML | 0 | x | x | x | x | x |
| IL | x | x | x | x | x | x |
| EF | 0 | x | x | x | x | x |
| IF-1 | x | x | x | x | x | x |
| IF-2 | x | x | x | x | x | x |
| IF-3 | x | x | x | x | x | x |
| MF-1 | x | x | x | x | x | x |
| MF-2 | 0 | x | x | x | x | x |
| MF-3 | 0 | x | x | x | x | x |
| EL-1 | 0 | x | x | x | x | x |
| EL-2 | 0 | x | x | x | x | x |
| EL-3 | 0 | x | x | x | x | x |
| MIII-1 | x | x | x | x | x | x |
| MIII-2 | 0 | x | x | x | x | x |
| MIII-3 | 0 | x | x | x | x | x |
| PEI-1 | 0 | x | x | x | x | x |
| PEI-2 | 0 | 0 | 0 | x | x | x |

Note. Entries indicate recovery (x) or lack of recovery
(0).

after a rest period of 6 days following satiety without bias to the results, and if for some reason, IF were the sole measure of interest, recovery might be considered to be complete after only 3 days.

## Comparison with Results of Previous Studies

The major effects of prior exhaustion found in this study--a lengthening of postejaculatory intervals and a decrease in the number of ejaculations--have been consistently noted in previous studies. While each of these early studies contained flaws, as outlined earlier, comparisons with earlier data are of interest.

Postejaculatory interval.--The lengthening of PEI has been a pronounced effect at every recovery interval of less than 11 days ever measured. It was by far the strongest effect found by Larsson (1956). Beach and Jordan (1956) found an increase in PEI at 3 and 6 days of recovery for all series. Karen and Barfield (1975) found a statistically significant lengthening of PEI-1 at 3 and 6 days but did not compare PEI-2. In the present study no significant increase in PEI-1 was found beyond 3 days, but the differences found in PEI-2 extended this effect for the first time to a period of 9 days following satiety.

Ejaculation frequency.--The number of ejaculations achieved in tests after various intervals of recovery from satiety has been reported by Beach and Jordan (1956) and by Karen and Barfield (1975). Larsson's (1956) data on the

number of ejaculations achieved in a 1-hr test are not strictly comparable. Figure 1 shows mean EF values from the present study (for 3, 6, 9, 11, 13, and 15 days), from Beach and Jordan's study (for 1, 3, 6, and 15 days), and from the study of Karen and Barfield (for 3 and 6 days, and two measurements at 15 days). A similar figure was presented by Beach and Jordan showing individual data points. Beach and Jordan's suggestion, quoted earlier, was that a curve drawn through the medians would reach asymptote between 10 and 15 days. Medians for Beach and Jordan's data and for data of the present study were actually quite close to their respective means, and are not presented here. Karen and Barfield did not report medians for their data.

The mean EF at 3 days of recovery was significantly different from that at 15 days in Karen and Barfield's study and in the present study (Table 21). Beach and Jordan did not perform tests of significance.

Although the tendency toward reduced EF after 6 days of recovery has been consistely found, this effect has not been shown statistically significant, either in the present study or by Karen and Barfield. It is conceivable that a true and reliable difference of very small magnitude may exist. The power of a test to detect such a small difference would ordinarily be quite low unless the sample size were great (Cohen, 1969).

Intromission frequency.--The resistance of IF to change due to prior satiety is another consistent finding across
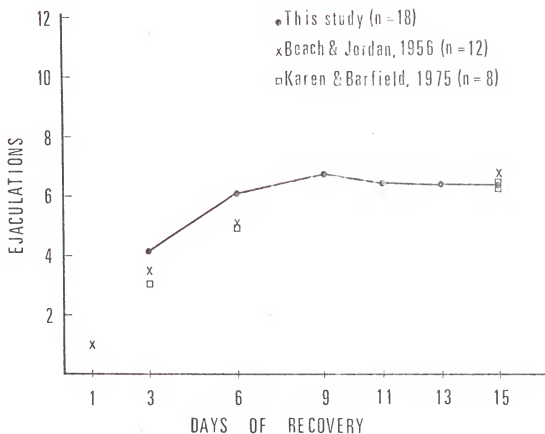
Figure 1.  Mean ejaculation frequency after inter-
vals of recovery from sexual satiety;
data from three studies.

(Only rats which ejaculated at least
once are included.)

studies (Larsson, 1956; Beach & Jordan, 1956; Karen & Barfield, 1975). The sole apparent exception occurs in the data of Beach and Jordan. They reported 8.2, 6.2, and 6.3 copulations per ejaculation for 3, 6, and 15 days, respectively. This apparently indicates an increase in IF after 3 days. Further analysis of these figures, however, resolves the apparent difference. The values reported are actually average intromission frequencies over all series. Since Beach and Jordan also reported that the normal copulatory pattern in fully rested rats involves a decrease from 10.6 intromissions in the first series to 6.0 in the second and slight further decreases in succeeding series, and since their Day 3 tests involved only an average of three series, it follows that the greater IF-1 value was more heavily represented in the average IF figure given for Day 3 than for later tests which involved five and six series. In fact, when the "copulations per ejaculation" figure is calculated on the basis of the fully rested IF values at each series and the Day 3 average IF, the result is 8.3. The apparent difference is thus resolved.

Other measures.--Results on IF and other within-series measures from the present study and three previous studies are presented in Table 22. The changes that have been found within series of copulations are not so pronounced as the effects discussed above, nor are these changes consistently

Table 22

Within-Series Measures After Incomplete Recovery
From Prior Satiety—Data From Four Studies

| Measure | Larsson (1956) (n = 33) | Beach & Jordan (1956) (n = 12) | Karen & Barfield (1975) (n = 8) | The Present Study (n = 18) |
|---|---|---|---|---|
| IF-1 | no change | no change | no change | no change |
| IF-2 | no change | no change | --- | no change |
| IF-3 | no change | no change | --- | no change |
| MF-1 | ---[a] | increase | --- | no change |
| MF-2 | --- | increase | --- | increase |
| MF-3 | --- | increase | --- | increase |
| EL-1 | no change | increase | no change | increase |
| EL-2 | (increase)[b] | no change | --- | increase |
| EL-3 | increase | no change | --- | increase |
| MIII-1 | increase | --- | no change | no change |
| MIII-2 | increase | --- | --- | increase |
| MIII-3 | increase | --- | --- | increase |

[a]Increase reported in the number of mounts per hour.

[b]Significant increase found in one experiment; no change found in another.

found.  Larsson, for example, repeatedly described the ef-
fects he found in EL, in rate of intromission, and in the
total number of mounts per hour as "slight."

The pattern of results across studies suggests that
these weak effects might show up more easily in the second
or third series than in the first series, in which values
are already naturally higher.  The exception to this is
Beach and Jordan's finding that EL-1 was greater at 3
days but that EL-2 and EL-3 were not.

That an effect be more readily demonstrated in later
series is a phenomenon frequently found in research on
copulatory behavior.  Dewsbury discussed this phenomenon
in studies of the effect of experience (Dewsbury, 1969) and
of drugs (Dewsbury & Davis, 1970; Dewsbury, 1971) and
suggested that it might be related to greater variability
in the first series than in later series.  A relationship
between series and strength of effect would be pertinent
to the interpretation of studies which include  only one
copulatory series.

Like within-series measures, latencies to begin copu-
lation have not shown entirely consistent results.  These
measures were not reported by Larsson or by Karen and Bar-
field.  Beach and Jordan found increases in both mount and
intromission latencies on Day 3, while in the present study,
only ML was significantly affected.  Mount and intromission
latencies tend  to  be highly variable, since most scores

usually cluster about a minimum, while occasional scores
might diverge extremely in one direction. The problem of
variability in ML and IL has been discussed by Dewsbury
(1975) in the context of comparative studies of adaptive
significance.

## Models of Copulatory Behavior

Beach (1956) proposed that sexual behavior in the male
rat involves the operation of two different mechanisms. The
arousal mechanism (AM) mediates the initiation and main-
tenance of sexual excitement. When the level of arousal
reaches a certain threshold, the copulatory mechanism (CM)
is activated. The execution of mounts, intromissions, and
ejaculations is held to be dependent on the CM. The state
of the AM should be reflected in mount and intromission
latencies and postejaculatory intervals. Sexual satiety
was described as a failure of arousal (Beach, 1956).

To account for their finding that copulation appears
faster and more efficient (lower IF, EL, and MIII) in the
second and subsequent series than in the first and their
finding that PEI grows progressively longer, Beach and
Jordan (1956) suggested that the first ejaculatory series
has two effects: it sensitizes the CM (facilitating sub-
sequent copulation), and it depresses the AM (cumulative
action of which accounts for the lengthening of PEI).

Beach and Whalen (1959) investigated the duration of
the facilitatory effects of the first ejaculation (or the

first series) on the subsequent series by removing the
female for a period from 15 min to 7 hr after ejaculation.
Because they found ML and IL on replacement of the female
to be shorter than at the beginning of the first series,
they proposed that the initial ejaculatory series stimu-
lates both the CM and AM and that the lengthening of the
PEI is due to nonsexual fatigue.  That is, according to
the revised model, the sensitization of the CM results in
lower values for measures within the next series, as be-
fore, but nonsexual fatigue masks sensitization of the AM
and produces a PEI.  The fatigue wears off enough that the
sensitized AM sparks the beginning of the next series and
accounts for the shorter ML and IL on reintroduction of the
female after an enforced PEI.  Accumulation of the fatigue
with each series causes the successive lengthening of PEI
(Beach & Whalen, 1959).

That satiety should be attributable simply to buildup
of fatigue is intuitively unsatisfying.  Copulation does
not seem so physically exerting that the effect of fatigue
should still be present after 9 days  of rest following
sexual satiety, as found in the present study.  Boland and
Dewsbury (1971) found increases in sleep following sexual
satiety in male rats, but of a different character and to
a greater extent than they did following a comparable
amount of exercise obtained from wheel running.

Further doubt was cast on the fatigue hypothesis by
studies of prolonged PEIs early and late in extended

sessions of copulation (Dewsbury & Bolce, 1968; 1970). Prolongation of PEI-1 beyond the point at which the presumed fatigue has dissipated enough for the AM to activate the CM should result in less accumulation of fatigue and a shorter PEI-2 than usual. Dewsbury and Bolce (1970) found PEI-2 to be longer than usual. Prolongation of a PEI late in a satiety session should allow a lesser accumulation of fatigue to postpone the rat's reaching the satiety criterion. Dewsbury and Bolce (1968) found that a 1-hr PEI-4 (which normally would have been about 10 min and no longer than 30 min) produced instead a decrease in EF that was significant in one condition and not so in another.

The difficulty that prompted Beach and Whalen to propose fatigue in the first place was that ML and IL were shorter when the female was replaced after a prolonged PEI-1, whereas if the first series is supposed to depress the AM (to account for PEIs), it should have depressed these latencies as well. But there are alternative interpretations which do not necessitate the postulation of fatigue to explain satiety. The major alternative is the possibility that the initial latencies and PEI are not both controlled by the AM.

McGill (1965) has adduced some evidence that they are not, at least in mice, in that ML and PEI do not vary together across strains of mice. That is, a single strain

could have high values of one and low values of the other. The same lack of relationship can be noted in inbred strains of rats from data presented by Dewsbury (1975). Of four strains, the one with the highest ML and IL also had the shortest PEIs.

The model of rodent copulatory behavior proposed by McGill (1965) involves three processes. The arousal mechanism (AM), responsible for initiation of sex behavior, is sensitized by intromission and ejaculation. The copulatory mechanism (CM), activated by the first intromission, maintains excitement for a critical period of time until the threshold for ejaculation is reached. The CM is also sensitized by intromission and ejaculation. The third process is the ejaculatory mechanism (EM), discharged at ejaculation. Until a certain amount of recovery has occurred, this mechanism prevents the AM from operating, and the EM is progressively depressed if full recovery is not allowed between ejaculations.

Karen and Barfield have also proposed that three different processes underlie the three different rates of exhaustion found in their data. One rate was found for within-series measures, and two for the two components they distinguished within the PEI--the absolute refractory period (ARP) and the relative refractory period (RRP)(Karen & Barfield, 1975).

Based on observations of the behavior of males between series, Beach and Holtz-Tucker (1949) had suggested that the PEI was composed of two such phases. From a finding that

"superfacilitation" in the series of copulations resulted from PEIs prolonged just beyond normal length, Larsson (1959b) concluded that ejaculation is followed by an absolute, then a relative, refractory period and that ordinarily the next series begins during the RRP before recovery is maximal.

In work published since the present research was conducted, Barfield and Geyer (1974) discovered that the male rat emits ultrasonic vocalization during about the first 75% of the PEI and is unresponsive then to painful stimuli which, during the last quarter of PEI, could function to induce reinitiation of copulatory behavior. Defining an ARP and an RRP on the basis of the duration of vocalization, Karen and Barfield (1975) found different rates of exhaustion for the two components--linear increase for the ARP and postively accelerating for the RRP--as compared with a U-shaped function for EL, MIII, and IF. Thus, they proposed three processes at work.

The finding of the present study that a considerably slower rate of recovery from satiety is found in PEI than is found in other measures is consistent with all of the models discussed, since all assume the operation of at least two different processes or mechanisms. Two points of difficulty are raised, however, by the results of this study. The differences in the recovery patterns found in PEI and in ML and IL make one hesitant to ascribe both to the action

of a single mechanism, the AM. Beach and Whalen's (1959)
finding that the effect of the first ejaculatory series on
ML and IL was different from the effect on PEI might be ex-
plained on the basis that "ML" and "IL" on replacement of
the female after an enforced PEI are not the same as the
initial latencies. But the present study gives clearer in-
dication that ML and IL do not behave in the same manner
found in PEI.

The analysis of PEI into two components could con-
ceivably resolve this discrepancy. It might be that Karen
and Barfield's (1975) ART is reflecting what McGill (1965)
termed the ejaculatory mechanism and that the RRP is subject
to the AM as are the initial latencies. On the other hand,
the satiation functions Karen and Barfield reported for the
two refractory periods indicate that this is not a solu-
tion. The ART increases linearly with succeeding series at
a low rate. It is the RRT which increases steeply as
satiety approaches, supplying the characteristic shape of
the PEI. Karen and Barfield also reported recovery data
for these measures. The significant increase they found in
PEI-1 on Day 3 and Day 6 was also found in the RRT alone,
while the ART component had recovered by Day 6.

Thus the original problem remains of two measures
supposedly reflecting the action of a single mechanism but
behaving differently. It may be that the differences re-
flect some interaction of the effects of copulations and

ejaculations preceding the original satiety and of copula-
tions and ejaculations occurring during the recovery test.

The second point raised by results of the present study
is that while within-series measures are assumed to be con-
trolled by the same mechanism, the CM, they do not appear to
recover from the effects of satiety in a unitary fashion.
Most measures showed increased values on Day 3 which de-
creased to normal on Day 6, but IF showed no increase at all
on Day 3. It seems reasonable to suppose that the stability
of IF in recovery tests reflects a faster recovery than seen
for other within-series measures. None of the studies in
which rats were observed after a 1-day recovery period re-
ported IF values for this interval (Stone & Ferguson, 1940;
Schwartz, 1956; Beach & Jordan, 1956). But IF does not seem
to be as strongly affected by satiety as other measures.
Even though IF shows a generally U-shaped function like the
others (Karen & Barfield, 1975), the increases occurring as
satiety approaches are not nearly so marked in IF as in EL
and MIII (Dewsbury, 1968).

With respect to both points, it appears either that a
single mechanism shows different effects in different meas-
ures or that the number of necessary mechanisms is greater
than previously supposed. Future theoretical accounts should
probably consider this question.

## Change in Baseline over Time

An unexpected finding of this study was that copulatory behavior in fully rested animals changed over the course of the experiment. Fewer ejaculations, longer ejaculation latencies, longer intervals between intromissions, and more mounts without intromission were seen in the sessions establishing satiety near the end of the experiment than at the beginning. Several possible explanations suggest themselves.

Age.--Subjects in this experiment were aged 3 months (puberty) at the time of their first copulation to satiety and were 8 months old at the end of the study. Larsson and Essberg (1962) found differences in copulatory behavior between 3-month-old and 5 1/2-month-old males. However, these changes were in the direction of facilitation of the behavior, including an increase in EF and a decrease in EL. Likewise, Beach and Whalen (1959) found MF lower at 14 months of age than at 4 months. Larsson (1956) reported the highest sexual potency (EF in 1 hr) to occur at about 1 year of age. The effect found in the present study seems, therefore, to have occurred in spite of the increase in subjects' age, rather than because of it.

Experience.--Each subject experienced copulation to satiety a total of 13 times in the course of this investigation. Prior experience has been shown to produce small but reliable facilitating effects on almost all measures of copulatory behavior in male rats in the 3- to 6-month age

range (Dewsbury, 1969; Larsson, 1959a). Thus, it is diffi-
cult to attribute the decrements in copulatory behavior ob-
served in the present experiment to either age or experience.

Accumulation of sexual fatigue.--Even though a male rat
may copulate to satiety and show no residual effects in
copulatory performance 15 days later, it is possible that a
very slight influence of exhaustion remains which repeated
testing may allow to accumulate and become visible. It is
difficult to understand, however, what might be the nature
of an influence that could persist for so long a period.
This explanation seems even more unlikely in light of the
results of the present study, showing recovery to be com-
plete by 11 days following satiety. Nevertheless it remains
an untested possibility.

Seasonal or cyclic fluctuations in sex behavior.--Most
species show some seasonal changes in reproductive func-
tions. Wild populations of Rattus rattus undergo a yearly
cycle in which reproduction is lowest in the winter (Tamarin
& Malecha, 1972). In his study of Rattus norvegicus in a
controlled natural environment, Calhoun (1962) found that
October to February was a period when young were not raised.
He also reported seasonal variation in the descent of
testes, which was not under the control of temperature. In
the winter the testes of most males were retracted into the
abdomen. From April through June almost all males were
found with testes in the scrotum, and the proportion began

to decline in August (Calhoun, 1962). The present study was conducted during the months of April through August.

Although seasonal variation appears not to have been reported for Rattus norvegicus in the laboratory, it is not impossible for seasonal changes to persist even in a controlled environment. The white-footed mouse (Peromyscus leucopus), for example, continues to show seasonal changes in gonad function (Bartke & Chang, 1973) and in reproduction (Rood, 1966; Dewsbury, personal communication, 1975) even under constant laboratory conditions of temperature, lighting, and diet. The possibility of subtle seasonal changes in copulatory behavior in the laboratory rat is, therefore, plausible.

In any case this adjunctive result of the present study has raised a question which has potential significance for the interpretation of past and future research in copulatory behavior. It would seem to be worth pursuing experimentally.

Interaction of Long Term Changes with Recovery Effects

The demonstration of a change in behavior over time, whatever its origin might be, presents a potential confounding factor. If some influence was operating in this experiment to produce changes over time in the nonexperimental satiety sessions, that influence must also have been present during the experimental tests which alternated with them. However, the differential effect of occurring early

in the study or late in the study was balanced equally for all levels of the independent variable (recovery intervals) through the Latin-square procedure of randomizing running orders. Each of six recovery intervals occurred once at each of six time periods (first, second, . . ., sixth). The fact that not a single analysis of variance revealed the slightest interaction between recovery intervals and groups (running orders) demonstrates the efficacy of this design in controlling the effect of the time factor.

APPENDIX

Table A1

Ejaculation Frequency in Seven Nonexperimental
Sessions--Summary of Analysis of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| Regression | 361.31 | 23 | | | |
| Session | 115.36[a] | 6 | 19.26 | 9.30 | <.0001 |
| Subjects | 245.75[a] | 17 | | | |
| Error | 211.30 | 102 | 2.07 | | |
| Corrected total | 572.61 | 125 | | | |

[a]Corrected (partial) sum of squares

Table A2

Ejaculation Latency, Series 1, 2, and 3 in Seven
Nonexperimental Sessions--Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | $F$ | $p$ |
|--------|---------------|----|-------------|-----|-----|
| | | EL-1 | | | |
| Regression | 3,055,058.20 | 23 | | | |
| Sessions | 518,608.83[a] | 6 | 86,434.80 | 2.30 | < .05 |
| Subjects | 2,536,449.37[a] | 17 | | | |
| Error | 3,838,127.46 | 102 | 37,628.70 | | |
| Corrected total | 6,893,185.66 | 125 | | | |
| | | EL-2 | | | |
| Regression | 740,589.24 | 23 | | | |
| Sessions | 104,588.60[a] | 6 | 17,431.43 | 2.30 | < .05 |
| Subjects | 636,000.63[a] | 17 | | | |
| Error | 773,120.25 | 102 | 7,579.61 | | |
| Corrected total | 1,513,709.49 | 125 | | | |
| | | EL-3 | | | |
| Regression | 2,965,609.27 | 23 | | | |
| Sessions | 713,051.52[a] | 6 | 118,841.92 | 1.54 | NS |
| Subjects | 2,252,557.75[a] | 17 | | | |
| Error | 7,883,856.19 | 102 | 77,292.71 | | |
| Corrected total | 10,849,465.47 | 125 | | | |

[a]Corrected (partial) sum of squares.

Table A3

Intromission Frequency, Series 1, 2, and 3, in
Seven Nonexperimental Sessions--
Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|---|---|---|---|---|---|
| | | IF-1 | | | |
| Regression | 1,162.75 | 23 | | | |
| Sessions | 111.60[a] | 6 | 18.60 | 2.72 | <.05 |
| Subjects | 1,051.14[a] | 17 | | | |
| Error | 696.97 | 102 | 6.83 | | |
| Corrected total | 1,859.71 | 125 | | | |
| | | IF-2 | | | |
| Regression | 107.47 | 23 | | | |
| Sessions | 9.52[a] | 6 | 1.59 | < 1 | NS |
| Subjects | 97.94[a] | 17 | | | |
| Error | 193.33 | 102 | 1.90 | | |
| Corrected total | 300.80 | 125 | | | |
| | | IF-3 | | | |
| Regression | 356.17 | 23 | | | |
| Sessions | 51.75[a] | 6 | 8.63 | 1.03 | NS |
| Subjects | 304.42[a] | 17 | | | |
| Error | 855.97 | 102 | 8.39 | | |
| Corrected total | 1,212.13 | 125 | | | |

[a]Corrected (partial) sum of squares.

Table A4

Mount Frequency, Series 1, 2, and 3, in
Seven Nonexperimental Sessions--
Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | F | p |
|--------|----------------|-----|-------------|------|------|
| | | MF-1 | | | |
| Regression | 576.86 | 23 | | | |
| Sessions | 106.32[a] | 6 | 17.72 | 1.22 | NS |
| Subjects | 470.54[a] | 17 | | | |
| Error | 1,483.62 | 102 | 14.55 | | |
| Corrected total | 2,060.54 | 125 | | | |
| | | MF-2 | | | |
| Regression | 211.75 | 23 | | | |
| Sessions | 67.11[a] | 6 | 11.19 | 2.40 | <.05 |
| Subjects | 144.64[a] | 17 | | | |
| Error | 475.75 | 102 | 4.66 | | |
| Corrected total | 687.50 | 125 | | | |
| | | MF-3 | | | |
| Regression | 1,877.51 | 23 | | | |
| Sessions | 527.63[a] | 6 | 87.94 | 1.71 | NS |
| Subjects | 1,349.87[a] | 17 | | | |
| Error | 5,257.79 | 102 | 51.55 | | |
| Corrected total | 7,135.30 | 125 | | | |

[a]Corrected (partial) sum of squares.

Table A5

Mean Interintromission Interval, Series 1, 2, and 3
In Seven Nonexperimental Sessions--
Summary of Analyses of Variance

| Source | Sum of Squares | df | Mean Square | $F$ | $p$ |
|---|---|---|---|---|---|
| | | MIII-1 | | | |
| Regression | 23,890.70 | 23 | | | |
| Sessions | 3,831.95[a] | 6 | 638.66 | 1.68 | NS |
| Subjects | 20,058.74[a] | 17 | | | |
| Error | 38,851.86 | 102 | 380.90 | | |
| Corrected total | 62,742.56 | 125 | | | |
| | | MIII-2 | | | |
| Regression | 13,753.79 | 23 | | | |
| Sessions | 2,030.19[a] | 6 | 338.37 | 2.26 | <.05 |
| Subjects | 11,723.60[a] | 17 | | | |
| Error | 15,250.93 | 102 | 149.52 | | |
| Corrected total | 29,004.71 | 125 | | | |
| | | MIII-3 | | | |
| Regression | 47,204.55 | 23 | | | |
| Sessions | 10,709.88[a] | 6 | 1,784.98 | 2.76 | <.05 |
| Subjects | 36,494.67[a] | 17 | | | |
| Error | 65,968.72 | 102 | 646.75 | | |
| Corrected total | 113,173.37 | 125 | | | |

[a]Corrected (partial) sum of squares.

Table A6

Postejaculatory interval, Series 1 and 2, in
Seven Nonexperimental Sessions--
Summary of Analyses of Variance

| Source | | | | | |
|--------|--------|-----|-----------|------|-----|
| | | PEI-1 | | | |
| Regression | 325,893.33 | 23 | | | |
| Sessions | 82,174.43[a] | 6 | 13,695.74 | 1.87 | NS |
| Subjects | 243,808.90[a] | 17 | | | |
| Error | 747,446.71 | 102 | 7,327.91 | | |
| Corrected total | 1,073,430.04 | 125 | | | |
| | | PEI-2 | | | |
| Regression | 277,836.87 | 23 | | | |
| Sessions | 28,988.63[a] | 6 | 4,831.44 | 1.45 | NS |
| Subjects | 248,848.23[a] | 17 | | | |
| Error | 340,811.94 | 102 | 3,341.29 | | |
| Corrected total | 618,648.80 | 125 | | | |

[a]Corrected (partial) sum of squares.

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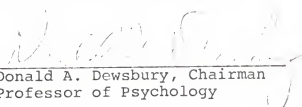
BIOGRAPHICAL SKETCH

Sally Jackson was born Sally Kendall Bolce in Oakland, California, January 21, 1943, and attended San Francisco Bay Area public and parochial schools until 1959. She graduated from Bishop Moore High School, Orlando, Florida, in 1960, and from Rollins College, Winter Park, Florida, in 1964.
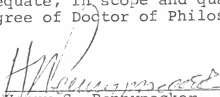
She attended the University of Florida from 1964 to 1968, receiving a master's degree in experimental psychology in 1967. After teaching for a year at Florida Southern College, Lakeland, Florida, she returned to the University of Florida in 1969 and completed data collection for this dissertation in 1971.

In 1972-73 Sally studied with Maharishi Mahesh Yogi in Arcata, California, and La Antilla, Spain, to become a teacher of Transcendental Meditation. She spent the next year and a half studying and working at Maharishi International University in Santa Barbara, California, and Fairfield, Iowa. At MIU she met Daniel Jackson, whom she married in December, 1974. Sally devoted 1975 to completing the dissertation, while living at Fenwick Free in historic St. Mary's County, Maryland. The Jacksons now live and work in Washington, D.C.
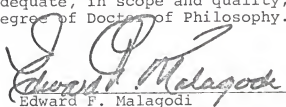
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

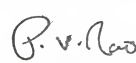Donald A. Dewsbury, Chairman
Professor of Psychology

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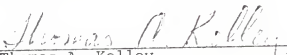
Henry S. Pennypacker
Professor of Psychology

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Edward F. Malagodi
Associate Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Merle E. Meyer
Professor and Chairman of
Psychology

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P. V. Rao
Professor of Statistics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Thomas A. Kelley
Assistant Professor of Statistics

This dissertation was submitted to the Graduate Faculty of the Department of Psychology in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1975

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Dean, Graduate School